

10018125 12 DEC 2001

FORM PTO 1300 (REV 10-94)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 3955.114USWO
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.5) unknown 10/018125
INTERNATIONAL APPLICATION NO. PCT/AU00/00722	INTERNATIONAL FILING DATE 26 June 2000	PRIORITY DATE CLAIMED 25 June 1999		
TITLE OF INVENTION STABILISATION OF SUBMARINE ELONGATE STRUCTURES				
APPLICANT(S) FOR DO/EO/US ELLIS et al.				
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:				
<p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).</p> <p>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(e)(2))</p> <p> a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau).</p> <p> b. <input checked="" type="checkbox"/> has been transmitted by the International Bureau.</p> <p> c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)</p> <p>6. <input type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(e)(2)).</p> <p>7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))</p> <p> a. <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau).</p> <p> b. <input type="checkbox"/> have been transmitted by the International Bureau.</p> <p> c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired.</p> <p> d. <input checked="" type="checkbox"/> have not been made and will not be made.</p> <p>8. <input type="checkbox"/> A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).</p> <p>9. <input checked="" type="checkbox"/> An unsigned oath or declaration of the inventor(s) (35 U.S.C. 371 (e)(4)).</p> <p>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(e)(5)).</p> <p>Items 11. to 16. below concern document(s) or information included:</p> <p>11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98.</p> <p>12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input checked="" type="checkbox"/> A FIRST preliminary amendment.</p> <p> <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items or information: International Publication Page, Form 1449, 9 references, Form PCT/ISA/210, Marked-up Copy, Abstract, 5 Sheets of Drawings</p>				

U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5) unknown 10/018125		INTERNATIONAL APPLICATION NO. PCT/AU00/00722		ATTORNEY'S DOCKET NUMBER 3955.114USWO	
17. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492(a) (1)-(5)): Search Report has been prepared by the EPO or JPO.....\$890.00 International preliminary examination fee paid to USPTO (37 CFR 1.492(a)(1)).....\$710.00 No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)).....\$740.00 Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(3)) paid to USPTO \$1040.00 International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)\$100.00				CALCULATIONS PTO USE ONLY	
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$1040.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	18 -20 = 0		X \$18.00	\$0.00	
Independent claims	5 -3 = 2		X \$84.00	\$168.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ \$260.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$1208.00	
Reduction by 1/2 for filing by small entity, if applicable. Small entity status is claimed pursuant to 37 CFR 1.27				\$	
SUBTOTAL =				\$1208.00	
Processing fee of \$130.00 for furnishing the English translation later than [] 20 [] 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				+ \$	
TOTAL NATIONAL FEE =				\$1208.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				+ \$	
TOTAL FEES ENCLOSED =				\$1208.00	
				Amount to be: refunded	\$
				charged	\$
a. <input checked="" type="checkbox"/> Check(s) in the amount of <u>\$1208.00</u> to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>13-2725</u> .					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO: Brian H. Batzli MERCHANT & GOULD P.O. Box 2903 Minneapolis, MN 55402-0903					
				SIGNATURE: <u>2-83</u>	
				NAME: Brian H. Batzli	
				REGISTRATION NUMBER: 32,960	

S/N unknown

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: ELLIS et al. Serial No.: unknown
Filed: concurrent herewith Docket No.: 3955.114USWO
Title: STABILISATION OF SUBMARINE ENLONGATE STRUCTURES

CERTIFICATE UNDER 37 CFR 1.10

'Express Mail' mailing label number: EV037644247US

Date of Deposit: 12 December 2001

I hereby certify that this correspondence is being deposited with the United States Postal Service 'Express Mail Post Office To Addressee' service under 37 CFR 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

By: 
Name: Chris Stordahl

PRELIMINARY AMENDMENT

Box PCT
Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment.

IN THE ABSTRACT

Insert the attached Abstract page into the application as the last page thereof.

IN THE SPECIFICATION

A courtesy copy of the present specification is enclosed herewith. However, the World Intellectual Property Office (WIPO) copy should be relied upon if it is already in the U.S. Patent Office.

IN THE CLAIMS

Please cancel claims 19-21 without prejudice.

Please amend claims 3-5, 11-12, and 15 as follows:

3. (Amended) A stabilisation system according to claim 1 wherein each restraint face is curved.
4. (Amended) A stabilisation system according to claim 1 wherein each restraint face comprises a continuous face.
5. (Amended) A stabilization system according to claim 1 wherein each restraint face comprises a discontinuous face defined by a plurality of restraint zones disposed in the required configuration.
11. (Amended) A restraint system according to claim 9 wherein each restraint face comprises a continuous face.
12. (Amended) A restraint device according to claim 9 wherein each restraint device comprises a discontinuous face defined by a plurality of restraint zones disposed in the required configuration.

15. (Amended) A stabilization system according to claim 8 wherein each end restraint comprises a restraint device, which comprises a pair of restraint faces spaced apart to define a gap therebetween to received a section of an elongate structure, each restraint face being configured to control curvature of the elongate structure during lateral deflection thereof, together with a collar structure adapted to be secured to the elongate structure and bear on the end restraint device to transfer axial loading thereto.

REMARKS

The above preliminary amendment is made to cancel claims 19-21, and to remove multiple dependencies from claims 3-5, 11-12, and 15.

A new abstract page is supplied to conform to that appearing on the publication page of the WIPO application, but the new Abstract is typed on a separate page as required by U.S. practice.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Marked-up Copy".

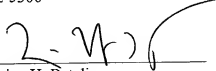
Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Brian H. Batzli (Reg. No. 32,960), at (612) 336.4755.

Respectfully submitted,

MERCHANT & GOULD P.C.
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Dated: 12 December 2001

By 
Brian H. Batzli
Reg. No. 32,960

BIIB:hjh

3955.114USWO

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3. A stabilisation system according to claim 1 [or 2] wherein each restraint face is curved.
4. A stabilisation system according to claim 1 [, 2 or 3] wherein each restraint face comprises a continuous face.
5. A stabilization system according to claim 1 [, 2 or 3] wherein each restraint face comprises a discontinuous face defined by a plurality of restraint zones disposed in the required configuration.
11. A restraint system according to claim 9 [or 10] wherein each restraint face comprises a continuous face.
12. A restraint device according to claim 9 [or 10] wherein each restraint device comprises a discontinuous face defined by a plurality of restraint zones disposed in the required configuration.

15. A stabilization system according to claim 8 wherein each end restraint comprises a restraint device [according to any one of claims 9 to 14] , which comprises a pair of restraint faces spaced apart to define a gap therebetween to received a section of an elongate structure, each restraint face being configured to control curvature of the elongate structure during lateral deflection thereof, together with a collar structure adapted to be secured to the elongate structure and bear on the end restraint device to transfer axial loading thereto.

[19. A stabilisation system substantially as herein described with reference to the accompanying drawings.]

[20. A restraint system substantially as herein described with reference to the accompanying drawings.]

[21. A method for stabilizing a submarine elongate structure as substantially as herein described.]

Title

"Stabilisation Of Submarine Elongate Structures"

Field Of The Invention

This invention relates to stabilisation of submarine elongate structures, such as
5 pipelines including single and multiple pipelines (bundled and unbundled),
umbilicals, cables, and other service conduits.

Background Art

Submarine elongate structures, and in particular submarine pipelines, can
become unstable through exposure to environmental influences, particularly
10 hydrodynamic loads arising from underwater currents and wave action. These
hydrodynamic loads typically increase in regions of shallow water. The
combination of extreme environmental loads and shallow water are present in
Australian waters, typically on the North West Shelf off the West Australian coast.

Various systems are currently utilised for submarine pipeline stabilisation,
15 including weight coatings on pipelines, coverings on pipelines, installation of
pipelines in trenches in the seabed, and securing pipelines to the seabed by way
of mechanical anchors. Various deficiencies and problems can be associated with
each of these stabilisation systems. For example, weight coating requirements for
pipelines can be very high or impracticable. Trenching of pipelines is required to
20 be deep in the seabed. Coverings over the pipeline need to be thick and of
adequate weight, and in some cases the covering material may itself be unstable.
Mechanical anchors of high capacity are required at close intervals to secure the
pipelines to the seabed.

While the abovementioned systems can be utilised in many situations, there are
25 locations where the cost involved can be very high or indeed prohibitive, and the
installation procedure can be time-consuming.

It is against this background, and the deficiencies and problems associated therewith, that the present invention has been developed.

DISCLOSURE OF THE INVENTION

The present invention provides a stabilisation system for a section of a submarine elongate structure comprising an end restraint at each end of the section of the elongate structure, each end restraint being adapted to be secured to the elongate structure to transfer axial tension generated by lateral movement of the elongate structure to the seabed or ground on which the end restraint is installed, each restraint comprising a pair of restraint faces spaced apart to define a gap through which the elongate structure can extend, each face being configured to control curvature of the elongate structure during lateral movement thereof.

At least one intermediate restraint may be provided between the two end restraints for limiting lateral movement of the structure at the location of the intermediate restraint.

The restraint locations provided by the end restraints and any intermediate restraint therebetween are spaced sufficiently to allow the elongate structure to move laterally and develop axial tension until an equilibrium position is achieved. The restraint locations are selected so as to maintain axial tensions (and associated axial stresses) within allowable limits and to ensure that the extent of lateral movement of the elongate structure between the restraint locations is within an allowable range.

The configuration of the two restraint faces of each restraint allows the elongate structure to curve to one side or the other at the restraint location (depending on the direction of lateral movement) while limiting the maximum extent of curvature.

Preferably, each restraint face is curved.

Each restraint face can be either a continuous face, or a discontinuous face in the sense that it comprises a plurality of restraint zones disposed in the required

configuration. Each restraint zone may be defined by a restraint column embedded in the seabed or ground. The columns may be connected one to the other to provide an integral restraint structure.

5 The present invention further provides a stabilisation system for a section of a submarine elongate structure comprising an end restraint at each end of the section of the elongate structure and at least one intermediate restraint between the two end restraints for limiting lateral movement of the structure at the location of the restraint, each end restraint being adapted to be secured to the elongate structure to transfer axial tension generated by lateral movement of the elongate structure to the seabed or ground on which the end restraint is installed, each
10 restraint comprising a pair of restraint faces spaced apart to define a gap through which the elongate structure can extend, each face being configured to control curvature of the elongate structure during lateral movement thereof.

The invention also provides a restraint device comprising a pair of restraint faces
15 spaced apart to define a gap therebetween to receive a section of an elongate structure, each restraint face being configured to control curvature of the elongate structure during lateral deflection thereof.

Each restraint face of the restraint device may be of a construction as set forth above in relation to the stabilisation system according to the invention.

20 The or each intermediate restraint used in the stabilisation system according to the invention may comprise a restraint device as defined above.

Each end restraint used in the stabilisation system according to the invention may comprise a restraint device as defined above together with a collar structure adapted to be secured to the elongate structure and bear on the restraint device
25 to transfer axial loading thereto.

The invention also provides a method of stabilising a submarine elongate structure comprising the steps of: anchoring two axially spaced apart sections of the elongate structure to the seabed or ground using end restraints, each restraint

presenting two restraint faces on opposed sides of the elongate structure, each restraint face being of a configuration for limiting curvature of the elongate structure.

5 The method may further include the step of installing one or more intermediate restraints between the two end restraints.

The invention still further provides a method of stabilising a submarine elongate structure comprising the steps of: anchoring two axially spaced apart sections of the elongate structure to the seabed or ground using end restraints, and installing one or more intermediate restraints between the two end restraints; each restraint
10 presenting two restraint faces on opposed sides of the elongate structure, each restraint face being of a configuration for limiting curvature of the elongate structure.

BRIEF DESCRIPTION OF THE DRAWINGS

15 The invention will be better understood by reference to the following description of one specific embodiment thereof as shown in the accompanying drawings in which:

Figure 1 is a schematic plan view of a section of a pipeline fitted with a stabilisation system according to the embodiment;

Figure 2 is an elevational view of Figure 1;

20 Figure 3 is a fragmentary plan view of the pipeline, showing a pair of intermediate restraint devices;

Figure 4 is a side elevational view of Figure 3;

Figure 5 is a sectional view on line 5-5 of Figure 3;

25 Figure 6 is a fragmentary plan view of the pipeline showing an end restraint;

- 5 -

Figure 7 is a fragmentary plan view of part of the end restraint,

Figure 8 is a side view of Figure 7;

Figure 9 is an end view of the collar structure; and

Figure 10 is a sectional view on line 10-10 of Figure 6.

5 BEST MODE(S) FOR CARRYING OUT THE INVENTION

The embodiment shown in the drawings is directed to a stabilisation system 10 for stabilising a submarine pipeline 11 supported on a seabed 13 below water level 14.

10 The stabilisation system 10 includes two end restraints 15, one at each end of the section of the pipeline requiring stabilisation (only one of the restraints 15 being shown in the drawings). The pipeline stabilisation system 10 further includes a plurality of intermediate restraints 17 positioned at intervals along the length of the pipeline 11. The intermediate restraints comprise restraint devices 20 are positioned in pairs, as will be explained in detail later.

15 The end restraints 15 are secured to the pipeline section to transfer axial tension, generated by lateral movement of the pipeline, to the seabed or the ground on which the end restraints 15 are installed. Typically, each end restraint 15 would be positioned on the seabed 13 as shown in the drawings, but it may be positioned on the ground (shoreline) at a location where the pipeline enters or exits the
20 water,

As mentioned above, the intermediate restraint devices 20 are positioned in pairs, as best seen in Figures 3 and 4 of the drawings. The intermediate restraint devices 20 are positioned in pairs in order to facilitate installation. In the event that larger capacity installation equipment is used, a combined single unit may be
25 used.

Each restraint device 20 comprises two opposed restraint faces 21 in spaced apart relationship to define a gap 23 therebetween through which the pipeline 11 extends. In this embodiment, each restraint face 21 is defined by a plurality of spaced apart columns 25, at least some of which are embedded in the seabed 13, as best seen in Figures 4 and 5. With this arrangement, each column 25 defines a restraint zone for restraining lateral movement of the pipeline.

The columns 25 are arranged in a curved formation so that the restraint face 21 that they define is of a curved configuration, as best seen in Figure 3 of the drawings. The columns 25a at one end are furthest apart and the columns 25b at the other end are closest together, so that the gap 23 between the faces 21 progressively increases from one end to the other. The upper ends of the columns 25 are interconnected by longitudinal elements 27 and transverse elements 29. With this arrangement, the combination of the columns 25 together with the longitudinal elements 27 and transverse elements 29 form a unitary structure 31.

The two restraint devices 20 in each pair are positioned such that the end columns 25b are adjacent each other and the corresponding restraint faces 21 in alignment. With this arrangement, the two restraint devices 20 co-operate to control the extent to which the pipeline 11 can curve to one lateral side or the other at the location at which the two restraint devices 20 are installed. This control is achieved by the curvature of the restraint faces 21.

Each of the end restraints 15 comprise a restraint device 40 of similar construction to the restraint devices 20, and a restraining collar structure 43 secured to the pipeline 11. As restraint device 40 is of similar construction to restraint device 20, similar reference numerals are used to identify like parts. The collar structure 43 presents an abutting face 45 which bears against the columns 25b which are positioned closest together. Co-operation between each collar structure 43 and the restraint device 40 against which it bears serves to transfer axial tension generated by lateral movement of the pipeline 11 to the seabed 13 (or ground) in which the restraint device 40 is anchored. The curved restraint faces 21 control the extent to which the pipeline 11 can curve at the end restraint 15.

The collar structure 43 is of split construction comprising two parts which can be bolted or otherwise secured together around the pipeline to clampingly engage the pipeline. Such an arrangement is particularly suitable in cases when the stabilisation system 10 is fitted to an existing pipeline. In cases when the

5 stabilisation system is fitted during installation of a new pipeline, the collar structure may be welded or otherwise secured to the pipeline.

The end restraints 15 are positioned at the ends of the pipeline section to be stabilised and the intermediate restraint devices 20 are positioned in pairs at appropriate intervals between the end restraints 15. Typically, the spacing

10 between each end restraint 15 and the adjacent intermediate restraint 17, and the spacing between intermediate restraints 17, could be in the order of one kilometre or more. Associated lateral movements of the pipeline 11 between the restraint locations can be in the order of 20 metres or more. This compares with

15 conventional restraint systems where restraint locations have spacings in the order of 20 metres and have negligible movement of the restrained pipeline between the restrained locations.

The fact that the restraint system according to the embodiment can have restraint locations at significantly greater spacings than conventional arrangements allows installation in considerably less time and at a considerably lower cost.

20 The feature whereby the restraint faces 21 in the end restraints 15 and in the intermediate restraints 17 control the extent to which the pipeline 11 can curve as it undergoes lateral movement, permits the use of restraint locations at significantly increased spacings in comparison to conventional arrangements.

In operation, the curved restraint faces 21 support the pipeline 11 as it undergoes

25 lateral movement and control the extent to which the pipeline can bend, thereby restraining lateral movement of the pipeline and stabilising the pipeline by ensuring that the lateral movement and the associated pipeline stresses are within allowable limits.

From the foregoing, it is evident that the present invention provides a simple yet highly effective arrangement for stabilisation of submarine pipelines and other like structures

- It should be appreciated that the scope of the invention is not limited to the scope of the embodiment described. There are, for example, instances where intermediate restraints would not be required between the end restraints. One such instance may be where a pipeline is relatively short (for example up to 1 km long). In such a case, the two end restraints are likely to work effectively without the need for any intermediate restraint.
- 10 Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS

1. A stabilisation system for a section of a submarine elongate structure, comprising an end restraint at each end of the section of the elongate structure, each end restraint being adapted to be secured to the elongate structure to transfer axial tension generated by lateral movement of the elongate structure to the seabed or ground on which the end restraint is installed, each restraint comprising a pair of restraint faces spaced apart to define a gap through which the elongate structure can extend, each face being configured to control curvature of the elongate structure during lateral movement thereof.
2. A stabilisation system according to claim 1 wherein at least one intermediate restraint is provided between the two end restraints for limiting lateral movement of the structure at the location of the intermediate restraint.
3. A stabilisation system according to claim 1 or 2 wherein each restraint face is curved.
4. A stabilisation system according to claim 1, 2 or 3 wherein each restraint face comprises a continuous face.
5. A stabilisation system according to claim 1, 2 or 3 wherein each restraint face comprises a discontinuous face defined by a plurality of restraint zones disposed in the required configuration.
6. A stabilisation system according to claim 5 wherein each restraint zone is defined by a restraint column adapted to be embedded in the seabed or ground.
7. A stabilisation system according to claim 6 wherein the columns are connected one to the other to provide an integral restraint structure.

8. A stabilisation system for a section of a submarine elongate structure comprising an end restraint at each end of the section of the elongate structure and at least one intermediate restraint between the two end restraints for limiting lateral movement of the structure at the location of the
5 restraint, each end restraint being adapted to be secured to the elongate structure to transfer axial tension generated by lateral movement of the elongate structure to the seabed or ground on which the end restraint is installed, each restraint comprising a pair of restraint faces spaced apart to define a gap through which the elongate structure can extend, each face
10 being configured to control curvature of the elongate structure during lateral movement thereof.
9. A restraint device comprising a pair of restraint faces spaced apart to define a gap therebetween to receive a section of an elongate structure, each restraint face being configured to control curvature of the elongate
15 structure during lateral deflection thereof.
10. A restraint device according to claim 9 wherein each restraint face is curved.
11. A restraint device according to claim 9 or 10 wherein each restraint face comprises a continuous face.
- 20 12. A restraint device according to claim 9 or 10 wherein each restraint device comprises a discontinuous face defined by a plurality of restraint zones disposed in the required configuration.
13. A restraint device according to claim 12 wherein each restraint zone is defined by a restraint column adapted to be embedded in the seabed or
25 ground.
14. A restraint device according to claim 13 wherein the columns are connected one to the other to provide an integral restraint structure.

15. A stabilisation system according to claim 8 wherein each end restraint comprises a restraint device according to any one of claims 9 to 14, together with a collar structure adapted to be secured to the elongate structure and bear on the end restraint device to transfer axial loading thereto.
- 5
16. A method of stabilising a submarine elongate structure comprising the steps of: anchoring two axially spaced apart sections of the elongate structure to the seabed or ground using end restraints, each restraint presenting two restraint faces on opposed sides of the elongate structure, each restraint face being of a configuration for limiting curvature of the elongate structure.
- 10
17. A method according to claim 16 further comprising the step of installing one or more intermediate restraints between the two end restraints.
18. A method of stabilising a submarine elongate structure comprising the steps of: anchoring two axially spaced apart sections of the elongate structure to the seabed or ground using end restraints, and installing one or more intermediate restraints between the two end restraints; each restraint presenting two restraint faces on opposed sides of the elongate structure, each restraint face being of a configuration for limiting curvature of the elongate structure.
- 15
- 20
19. A stabilisation system substantially as herein described with reference to the accompanying drawings.
20. A restraint device substantially as herein described with reference to the accompanying drawings.
21. A method of stabilising a submarine elongate structure substantially as herein described.
- 25

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(19) World Intellectual Property Organization
International Bureau

10018125.030303

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4 January 2001 (04.01.2001)

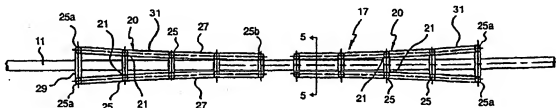
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- (71) Applicant (for all designated States except US): J P KENNY PTY LIMITED [AU/AU]; 7th Floor, St Georges Square, 225 St Georges Terrace, Perth, W.A. 6000 (AU). (88) Date of publication of the international search report: 31 May 2001
- (72) Inventors; and
(75) Inventors/Applicants (for US only): ELLIS, Barry, Errol [AU/AU]; 7 Milne Street, Bicton, W.A. 6157 (AU).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: STABILISATION OF SUBMARINE ELONGATE STRUCTURES



(57) Abstract: A stabilisation system (10) for a section of a submarine pipeline (11) comprising an end restraint (15) at each end of the section of the pipeline and intermediate restraints (20) between the two end restraints (15) for limiting lateral movement of the pipeline (11) at the location of the restraints (15, 20). Each end restraint (15) is adapted to be secured to the pipeline (11) to transfer axial tension generated by lateral movement of the pipeline (11) to the seabed or ground on which the end restraint is installed. Each restraint (15, 20) comprises a pair of restraint faces (21) spaced apart to define a gap (23) through which the pipeline (11) can extend. Each restraint face (21) is configured to control curvature of the pipeline (11) during lateral movement thereof. A restraint device and a method of stabilising a submarine pipeline is also disclosed and claimed.

1/5

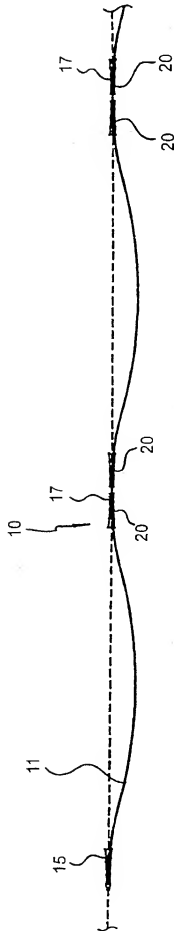


Fig. 1

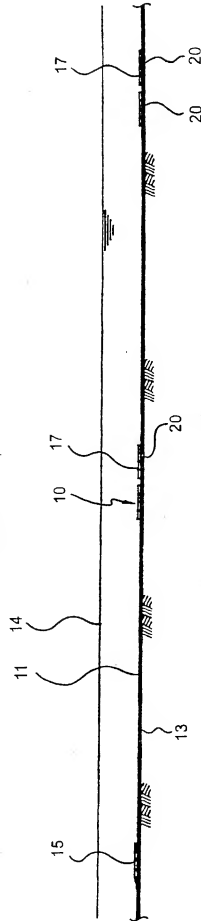
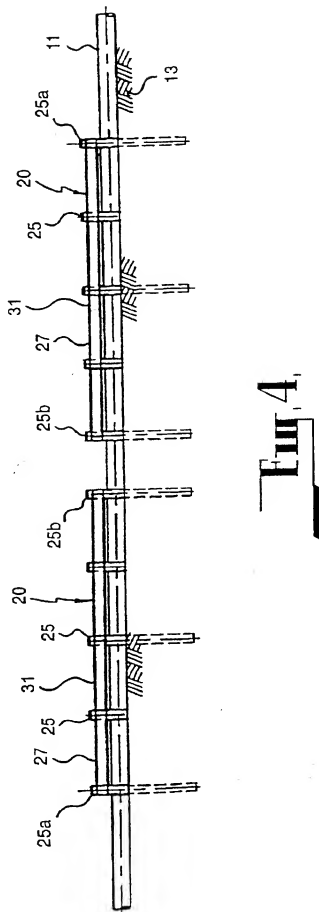
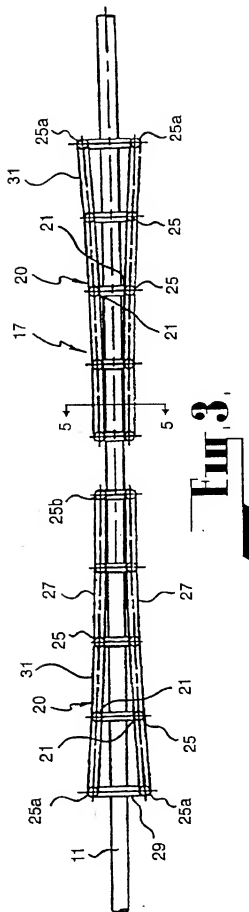


Fig. 2



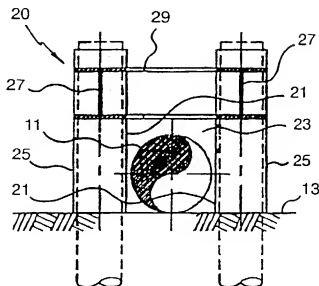


Fig. 5

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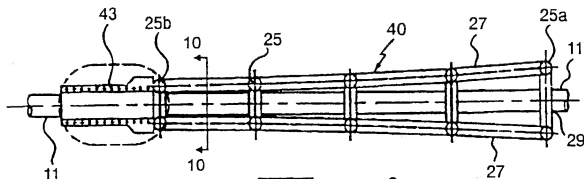


Fig. 6

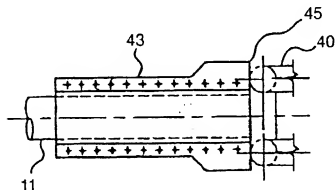


Fig. 7

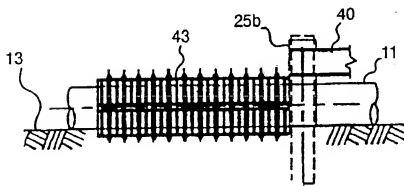


Fig. 8

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CT/AU00/00722

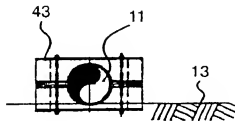


Fig. 9

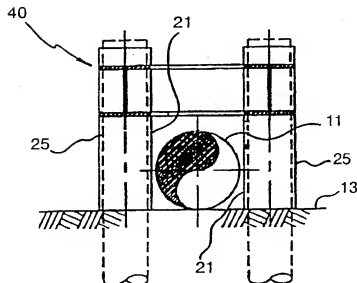


Fig. 10

Attorney Docket No. 3955.114USWO

MERCHANT & GOULD P.C.
United States Patent Application

COMBINED DECLARATION AND POWER OF ATTORNEY

As a below named inventor I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that

I verily believe I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **STABILISATION OF SUBMARINE ELONGATE STRUCTURES**

The specification of which

- a. ☐ is attached hereto
 b. ☒ was filed on 12 December 2001, as application serial no. _____ and was amended on _____ (if applicable) (in the case of a PCT-filed application) described and claimed in international no. PCT/AU00/00722 filed 26 June 2000 and as amended on _____ (if any), which I have reviewed and for which I solicit a United States patent.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119/365 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on the basis of which priority is claimed:

- a. ☐ no such applications have been filed.
 b. ☒ such applications have been filed as follows:

FOREIGN APPLICATION(S), IF ANY, CLAIMING PRIORITY UNDER 35 USC § 119			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)
Australia	PQ1196	25 June 1999	
ALL FOREIGN APPLICATION(S), IF ANY, FILED BEFORE THE PRIORITY APPLICATION(S)			
COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	DATE OF ISSUE (day, month, year)

I hereby claim the benefit under Title 35, United States Code, § 120/365 of any United States and PCT international application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. APPLICATION NUMBER	DATE OF FILING (day, month, year)	STATUS (patented, pending, abandoned)

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below:

U.S. PROVISIONAL APPLICATION NUMBER	DATE OF FILING (Day, Month, Year)

I acknowledge the duty to disclose information that is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, § 1.56 (reprinted below):

§ 1.56 Duty to disclose information material to patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is canceled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is canceled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

- (1) prior art cited in search reports of a foreign patent office in a counterpart application, and
 - (2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.
- (b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and
- (1) It establishes, by itself or in combination with other information, a *prima facie* case of unpatentability of a claim;
- or
- (2) It refutes, or is inconsistent with, a position the applicant takes in:
 - (i) Opposing an argument of unpatentability relied on by the Office, or
 - (ii) Asserting an argument of patentability.

A *prima facie* case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

- (c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:
- (1) Each inventor named in the application;
 - (2) Each attorney or agent who prepares or prosecutes the application; and
 - (3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.
- (d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.
- (e) In any continuation-in-part application, the duty under this section includes the duty to disclose to the Office all information known to the person to be material to patentability, as defined in paragraph (b) of this section, which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby appoint the following attorney(s) and/or patent agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected herewith:

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(51)

I hereby authorize them to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct Merchant & Gould P.C. to the contrary. I understand that the execution of this document, and the grant of a power of attorney, does not in itself establish an attorney-client relationship between the undersigned and the law firm Merchant & Gould P.C., or any of its attorneys.

Please direct all correspondence in this case to Merchant & Gould P.C. at the address indicated below:

Merchant & Gould P.C.
P.O. Box 2903
Minneapolis, MN 55402-0903



I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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2	Full Name Of Inventor <u>2-00</u>	Family Name <u>FOGLIANI</u>	First Given Name <u>Antonino</u>	Second Given Name <u>John</u>
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